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This series of southern Uto-Aztecans has been variously classified into sub-groups[1] but recent studies tend to minimize the distinctions.[2] However, there is agreement to the effect that Piman, as spoken by both the Upper and Lower Pima, finds its closest affiliations with Tepecano and Tepehuane. Whorf would even call the three one language, with separate dialects.[3] These linguistic relatives of the Pimans are now so merged with the Mexican population that it is difficult to reconstruct their culture. Information must come largely from Spanish sources, which mention their irrigation;[4] their houses of wattle and daub or of adobe;[5] their cotton raising and cotton garments.[6] They were apparently, agriculturists and irrigators who shared many customs with the Pima, as first known to history. Similar in culture, though slighty variant in language, were the Opata, wedged between the Upper and Lower Pima so closely that Spanish writers sometimes generalized about the whole area as one.

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The country occupied by these congeners of the Pimans ranged from the tree clad mountain slopes of the Tepehuane to the lowlands of the Opata where oak and grass began to give way to desert vegetation. It was cut by small streams, flowing ultimately toward the Gulf of California and in whose valleys clustered the wattle and daub houses, with their irrigated fields. But, toward its northern end, it dipped into the hot, low Colorado Desert and the last of its irrigated valleys, that of the Gila, was separated from the others by an expanse of arid country where agriculture could scarcely survive. This was the country of the Papago. It was a tongue of the western desert thrust into an agricultural area and it forced its inhabitants to a different way of life from that of their congeners to north and south.

North of it was the Gila whose valley was, as far as the accounts can show, a cruder version of the irrigated valleys of Sonora. This was a frontier beyond which irrigation stopped, for to the west, stretched the Colorado Desert: to the north the Colorado Plateau rose in an abrupt wall. At this point, the line of Uto-Aztecans was broken. It was resumed on the Plateau, in the Hopi villages and continued north through the Basin and Range Country, among groups of largely nomadic food gatherers. To the west, beyond the

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[1] Kroeber, 1934, p. 16.
[2] Whorf, 1935, p. 608.
[3] Whorf, 1935, p. 608.
[4] Beals, 1932, p. 158.
[5] Beals, 1932, p. 176.
[6] Beals, 1932, pp. 170, 172, 173.

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Colorado, other food gatherers, the Southern California Shoshoneans, extended it almost to the sea. But, between the Pimans and these congeners of simpler culture, was thrust a wedge of another stock, the Yuman, occupying the Colorado River valley and its adjacent highlands so as effectually to separate the southern agriculturists from the northern and western food gatherers.

Pimans thus found themselves at the meeting point of several areas, both cultural and geographic and, because of their situation in open desert country, they were in easy communication with all. Well worn routes led to the south where they traded with their more prosperous linguistic relatives. To the west, a few days journey over identical desert country brought them to the River Yumans, whose living conditions were so similar that the equipment of the two peoples often coincides, point for point. To the northwest, open Basin and Range country continued into the great stretches occupied by their Shoshonean kin.

Travel was more difficult to the northeast, where the Pueblos stood on the high plateau that marks the change from torrid to temperate country. At least in historic times, the intervening rough country was held by Apache, enemies of the Pimans. Yet, in prehistoric times, it was down over the Mogollon Rim that Pueblo immigrants filtered into the Gila and it is with the Hopi, above the Rim, that the Papago show some of their most obvious likenesses.

It was only at the east that communication stopped. There, in historic times, lived the Apache, whom the Pimans met only in war skirmishes and from whose country they brought not a shred of booty to spread its evil magic. Pimans owe nothing to the Athapascans except the constant stimulus derived from two centuries of warfare and any likenesses between the two peoples must be traced to a common source in the Pueblos.

The country of the Pimans themselves is a southern extension of the Basin and Range area which has been roughly described as a desert parallelogram, outlined by streams. It was the Pima, the River People, who occupied the stream valleys, while the Papago, the Desert People, made the best of the arid interior. Their land was a succession of flat valleys, floored with wind blown pebbles and interrupted by low mountain ridges, water and wind eroded into gullies and pinnacles. The ridges are never continuous and a wandering people could thread its way to and fro over the whole desert without encountering any obstacle but thirst. On the lower slopes grow giant cactus, cholla and prickly pear, widely spaced so that each may have its share of water and with their succulent stems veiled from the blinding light by forests of white thorns. Along the dry

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Pa Pi 137 stream beds the bean bearing mesquite and palo verde stretch their roots down to underground water. On the plain grows the creosote bush and sometimes nothing else.

Pa Pi 132 This is one of the hottest and driest areas in the United States, the annual rainfall in the interior being about five inches.[1] Yet those five inches rendered subsistence possible for the Desert People. They are concentrated in the summer months of July and August when the daily cloudburst produces a temporary flood which may cover the flat plain to a depth of six inches for a square mile. In a day or two there sprout the seeds of annuals which may have remained inactive for several seasons, awaiting sufficient moisture. The succulent cacti swell, storing water for the dry months. The deciduous trees put out tiny leaves, exposing to the glare as little green as possible.

Pa 221 For two months while the desert bloomed, the Papago picked and stored every root, stalk, leaf and fruit that it produced. Where the flood water had softened the soil, they planted small gardens which, begun in mid-July, had just time to mature before frost. All the harvest was dehydrated in the blazing desert sun and stored to furnish food in the dry months. Then the rain ceased; the rain reservoirs which had supplied drinking water for the valley dwellers dried up; life was impossible unless the population moved to the foothills where there were springs.

Pa [657] Until very recently, when the United States government has dug wells in the valleys, this was the life of the Papago. It precluded their having permanent houses, either for dwellings or for ceremonies. It prevented a centralized form of organization such as has been suggested for the Pima, both on the Gila and the San Pedro. But it kept the Papago unmolested until long after these others had disappeared or had assimilated White ways.

Pa ●174 Yet the Desert People, harassed by Nature as they were, found opportunity to practise all the arts described for the more fortunate Pima,[2] with only minor differences, due to materials. We may picture them, up to a few generations ago, living in round, semi-subterranean houses, often earth covered. They dressed in skirts and breechclouts of buckskin and, less often, cotton and wore sandals when they had any footgear at all. Their pottery was of coarse red clay, shaped by paddle and anvil with, only rarely, a decorated jar for offerings and seed storage. The bulk of their utensils was of basketry: plaited, coiled or netted in the intricate technique known as coil without foundation. These are old arts in

[1] Bryan, pp. 29—30.
[2] Russell, pp. 68—181. Castetter and Underhill, pp. 48—63.

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the area and at least the house and the red pottery rank with the simplest of the equipment once used there. Far more elaborate developments have taken place in Pimeria and been forgotten and one of the most absorbing questions occupying present day archaeology is the tracing of these developments and the connection with them of the modern Pimans.

PREHISTORY

The whole of Pima and Papago country is dotted with ruins, ranging from small, almost obliterated villages to elaborate communal buildings of several storeys, like that which still stands at Casa Grande. Villages may be found in the open desert[1] but the communal houses are clustered in the valleys of the large streams, the Gila and Salt, while a few are found on the smaller Santa Cruz. The valleys themselves are a network of ancient irrigation canals. The most recent survey reports a hundred and twenty five miles of such canals in the Salt River valley and half as many in the Gila[2] and the oldest of them so far excavated has been dated at 800 A.D.[3]

Until recently, communal houses and canals were thought to have belonged to one culture; a culture obviously so much more elaborate than that of the present Pimans, that it could have no connection with them. But the investigations of Gladwin[4], Woodward[5], and the University of Arizona, make it obvious that there have been two cultures in the area, the earlier, which built the canals, of long duration and the later which built the great houses, short and transitory. The canal building culture has some points in common with that of the modern Pimans and the question of their relation to it is now under debate.

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[1] Huntington, 1914, p. 47.
[2] Halseth, 1936, p. 42.
[3] Haury, 1936, p. 49.
[4] Gladwin, 1928, 1933. This paper went to press before the publication of Gila Pueblo's extended work on a Gila River site: Excavations at Snaketown, by Harold S. Gladwin, Emil W. Haury, E. B. Sayles, Nora Gladwin. Medallion Papers, XXV, Gila Pueblo, Ariz. 1937. The result is an unnecessarily extended statement on some points, both of history and prehistory, instead of summary and quotation. Our reading of the Spanish sources gives slightly different results from those of the Snaketown report. Nor do we here attempt a complete analysis of Mr. Gladwin's assumption of a Pima-Hohokam relationship which, while a tenable hypothesis, requires more penetrating and thorough work than it has yet received.
[5] Woodward, Arthur, The Grewe Site, mimeographed by Los Angeles Museum.

5: Castetter & Bell N-5 (1938-1940) 1942
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irrigation indicated by old ditches and reservoirs at Santa Rosa.

Historical and Ethnographical Evidence

When Kino and Mange[12] made their first explorations in Pimería Alta, the Pima on the Gila and the Sobaipuri in the San Pedro and Santa Cruz valleys were carrying on agriculture by means of canal irrigation, and an extensive system of ditches was observed by Font and Garcés[13] among the Pima of the Casa Grande-Casa Blanca district in 1775, also along the Gila in 1846 by Emory and in 1852 by Bartlett.[14] However the historical accounts indicate the agriculture of the Gila and its tributaries was of a lower cultural level than that of the irrigated valleys of Sonora. Nevertheless, Pima and Papago were rather good farmers and developed their agriculture to a fairly high degree of efficiency—a condition which still applies, particularly to the Papago. In fact the Papago had to be efficient farmers to wrest a subsistence from so reluctant and forbidding an environment. After the period of disorganization and migration contingent upon Apache raids, which preoccupied Pima and Papago from about 1750 until the Apache were finally subdued by the Federal Government in 1874, Piman agriculture slowly revived from the severe setback which it had suffered, and, at present, irrigation is practiced in the same river valleys where the Spaniards found it, although in portions of these valleys the Indians have been displaced by whites.

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The basis of Pima subsistence has become greatly modified since aboriginal times, much more so than that of the Papago, who because of their isolation as well as the limitations of their environment have remained relatively unaffected. In fact Pima economy has undergone such radical change over so long a time that it is now difficult to recon-

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12 Bolton, *Kino*, I, 205; Mange, *Luz*, pp. 248-49, 256.
13 Bolton, *Anza*, IV, 43; Coues, *On the Trail*, I, 107.
14 Emory, *Notes*, p. 81; Bartlett, *Narrative*, II, 232.

5: Castetter & Bell N-5 (1938-1940 1942
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Pi 174 241 Gila occasionally failed, and Russell[21] tells us this happened about every fifth year; this is supported by Anza, Eixarch, Font and others.[22] At times the river overflowed, destroying irrigation canals and washing out crops. Under such conditions of drought, flood or crop failure from other causes, the balance of food supply was markedly shifted in favor of the products of food gathering and hunting. In fact, in unfavorable years food was often as scarce as among the Papago, and the Pimas at such times might live with relatives whose crops had been good.

Pi 174 3/2 Aboriginal Pima agriculture was largely dependent upon canal irrigation from the Gila, although in places they used flood water from the washes, or water coming from the mountains in times of heavy rains and diverted by the use of temporary dikes on the flats.

Pa 174 221 Our field studies, as well as the early documentary material, reveal that the Papago, living in a very arid area with meagre agricultural possibilities, had imposed upon them a semi-nomadic life, planting and caring for their fields in the rainy period, and wandering about exploiting to the utmost the wild animal and vegetable resources of the land the rest of the year. For a period of at least three months wild plants were gathered by women; hunting was done by men, although it attained the status of a major occupation only among certain individuals. Anza[23] noted that in winter especially the Papago almost completely deserted their territory, and pictured aspects of their economy thus: "The Papago Indians who dwell in them live in greater misery and poverty than can be imagined. Seldom have they any fixed habitation, because, driven by necessity, they wander almost continually, sometimes in the sierras to maintain themselves by hunting deer, wild sheep, rats and certain roots; at other

[21] Russell, *Pima*, pp. 66-7.

[22] Bolton, *op. cit.*, III, 19, 353; IV, 45; *Report of the Commissioner of Indian Affairs* for 1871, p. 359; *ibid.* for 1875, p. 214; *ibid.* for 1878, pp. xxxix, 3; *ibid.* for 1904, pp. 7-21.

[23] Bolton, *op. cit.*, II, 17, 260-61.

5: Castetter & Bell N-5 (1938-1940) 1942
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times in the arroyos to live on the bean of the mesquite, and again in the plains, seeking the pitaya, the tuna, the sahuaro and other wild fruits. Sometimes they go to the Colorado River to obtain food amongst the Yumas through their skill in their disorderly dances, and at other times down to the missions of Pimería where, by the same means and by their tenuous labor, they obtain a little grain, and a few pieces of Sayal to cover the most immodest parts of their bodies." A similar uncomplimentary characterization of the region from Caborca to the mouth of the Colorado was given in 1764; the author, after describing the poverty of the country, referred to the Papago as eating "seeds of forage, herbs and wild fruits, and even rabbits and rats." Also, "Papagos is the name given by the Pimas to those particular Pimas who live in the desert as far as Tucson and ... up to the Gila, living on seeds, grass, rabbits, rats and wild fruits."[34] The same reference laments the poverty of the Papago country, stating these Indians at times went to the villages of the other Pimans where they worked as servants merely for their food, even going as far as San Ignacio and Dolores; they were so fond of meat that they ate horses and burros, and in returning to their lands even stole and ate dogs. Pfefferkorn,[35] too, describes the inferior basis of Papago subsistence.

In the Papago country permanent sources of water in association with tillable land are rare. This situation necessitated a compromise between sedentary life in villages and a migratory existence which expressed itself in seasonal movement usually between two kinds of villages. Those known as The Wells were situated at permanent sources of water in the mountains or foothills. The other type of village, designated The Fields, was in the open desert country adjacent to the cultivated areas, and twenty to thirty miles distant from their winter villages. Papago semi-nomadic life thus was not dictated primarily by the needs of hunting or agriculture but to

[34] *Documentos*, 3rd ser. IV, 554, 838; *Rudo Ensayo*, pp. 189-90.
[35] Pfefferkorn, *Beschreibung der Landschaft Sonora*, I, 10-12.

5: Castetter & Bell N-5 (1938-1940 1942
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get actual drinking water. Even so, permanent springs were widely scattered, and the women spent more time fetching water than gathering food. Such scarcity of water also had its compensation, for it was the Papago's best defense against the plundering Apache.

During winter, families camped as near as possible to a spring, water hole or *tinaja*, as exemplified along the western foothills of the Baboquivari Mountains and at Comobabi. But even this sometimes involved a daily trip of three or four miles, occasionally as much as ten, to fetch water, chiefly by the women. One Papago informant said that as a boy he had to make a daily trip of fifteen miles on horseback to secure water, carrying two ollas, each holding about three gallons. These water holes were not only sources of drink but of game, for here it was possible to stalk deer, antelope and mountain sheep. In places, water was secured from a very small spring where an olla had to remain under the drip for as long as half an hour, and in such cases women stood in line and sometimes had to spend the night, this constituting a social occasion. A few springs were large enough to be called wells, such as Badger Well in the Comobabi Mountains. The Papago enlarged it by building fires under its rocky walls to crack off the rocks. Occasionally a water supply at these winter villages was to be had only by patient digging in the sandy washes on the mountain pediment, and then at times in very small quantities along a plane of contact between sand and stone after scraping the sand away.

Families usually did not move down to the Fields until the heavy rains had begun, so as to be certain that drinking water would be found in the depressions which had been dug near each farming village, a fact noted by Font and by Garcés.[20] Such migration between the Fields and the Wells continues today, especially in the western half of the reservation. Often there were natural water holes or pools of

[20] Bolton, *Kino*, IV, 32; Coues, *op. cit.*, p. 64.

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standing water of variable size along channels where flood waters spread out over adobe flats and washes, in which case they were known as *charcos*, usually three to five feet deep. Dikes and ditches were sometimes constructed to assist in trapping and impounding the surface water in such depressions. At times small earthen dams or *represas* were constructed, usually in adobe flats, to impound flood waters for household purposes, later for the use of stock.[27] Such pools retained water from a few days to several months and on the whole remained available until October or November, when the deer dance closed the agricultural season. Mange[28] observed that the Papago at El Gubo had a small spring from which they drank, and that the Sobaipuri at Correa on the Santa Cruz got their drinking water from a deep well made in the *caza* of the river, but which was at this point evidently dry most of the time, as their agriculture was *de temporal*. Such easy seasonal access to water freed the women for food gathering, essentially a summer occupation. Before the time of wheat cultivation and the digging of government wells, the Papagos lived at their *temporales* during the summer months only, but now, with dependable sources of water and the necessity for sowing wheat in fall, the aboriginal situation has been greatly modified, and the seasonal migration between Wells and Fields has lost its importance. Formerly the village of Kaka depended wholly upon its *charco*, and when this dried up the Indians were compelled to move or fetch water from Moivavi, sixteen miles distant in the mountains.[29]

Obviously such natural limitations precluded permanent homes and formal and elaborate equipment, and gave expression to a type of economy characterized by small groups of peaceful, industrious, skilled agriculturists, meagre in equipment, and informal and decentralized in organization.

[27] Bryan, *Papago*, pp. 121, 257.
[28] Mange, *Luz*, pp. 250, 256.
[29] Hoover: *The Indian Country of Southern Arizona*, p. 52; *Generic Descent of the Papago Villages*, p. 259.

5: Castetter & Bell N-5 (1938-1940 1942
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174 Papago agriculture, involving no storage of water, was 244 characteristically of the primitive but efficient *de temporal* 312 "thunderstorm" type; that is, flood-water farming in which seed was planted in moist ground at the mouth of a wash after the first rains, which came in summer. This was reported as early as 1694 by Mange[20] at El Tupo, Tucabavia and Gubo, and there is a specific statement[21] to the effect that this was the customary method of planting by the Papago north of Casas Grandes. Kino reported the same for the Papago at San Rafael del Actúm Grande.[22] Although Gaillard[23] observed in 1894 that the Papago irrigated their crops with water drawn from natural or artificial dams, which he terms respectively *charcos* and *represos*, we have been wholly unable to confirm this practice, all our information being to the effect that such stored water was used only for domestic purposes. He gives the impression that this was the customary method of watering crops and makes no mention of flood-water farming. Bryan[24] points out that the difficulties of profitable storage of water in sufficient amounts for irrigation in the Papago country are very great. Also he has informed us in personal correspondence that he has seen no evidence that the Papago ever stored water for irrigation of fields.

174 To be sure, Papago agriculture was quite uncertain due 241 to irregularity of the rainy season, then later on account of Apache raids. In years when rains were late these Indians lived entirely on wild foods without planting at all. So tenuous was Papago agriculture that Mange,[25] head of a military detachment detailed to escort Kino, in a number of places asserts that in the late seventeenth century certain *rancherías* in Papaguería had no agriculture, living entirely on wild

[20] Mange, *op. cit.*, pp. 215, 229-30.
[21] *Documentos*, 3rd ser., IV, 833.
[22] Bolton, *op. cit.*, I, 309.
[23] Gaillard, *The Papago of Arizona and Sonora*, p. 293.
[24] Bryan, *op. cit.*, p. 143.
[25] Mange, *op. cit.*, pp. 216, 225, 263, 286-87.

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products. However, his visit may have followed a season when no crop was planted on account of late rains, such as Kino[26] cited in 1701 in the vicinity of San Rafael del Actúm Grande (in southern Arizona), where no maize had been raised by the Papago that year because of a like situation.

All our informants agreed that wild plants and animals formerly constituted a much larger, and much more dependable, fraction of the total Papago food supply than did cultivated plants. Seasonally women devoted themselves to the gathering of wild foods while men and boys hunted rabbits. When the wild foods ripened, large quantities were gathered and stored, but, just before the giant cactus harvest, food became very scarce, as indicated by one of their names for the period that would correspond to our month of May, *ko'ohk macat*, "the painful moon." One informant said that when he was a boy it was not uncommon to "be so hungry that a person became dizzy when he stood up." As in the past, so today, the Papago utilize much more wild plant and animal food than do the Pima; in fact, it is now comparatively rare to find the Pima gathering wild foods of any kind, while many Papago still utilize them to some extent as a matter of necessity, for Papago agriculture is today almost as precarious as in olden times.

Underhill[27] has well pointed out that poor as the Papago country was, its economics were those of abundance. Much the same outlook is still to be observed among the Pima, despite their deculturation. The Pimans did not hoard property; they were constantly making gifts, chiefly of food, for their food supply, meagre though it seems viewed from our standard of living, was more than sufficient for their simple needs, and anything beyond the bare necessities for sustaining life was regarded as a surplus. Papago migratory life, involving the difficulty of food storage, added to the problems of preserving food in so hot a land, greatly fostered

[26] Bolton, *loc. cit.*
[27] Underhill, *Papago*, pp. 90-2.

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this spirit of giving. But not only was the Papago practice of giving motivated by economic considerations; generosity was a high virtue and giving was truly an investment in good will. One who secured a reputation for penury definitely lost caste in village and family life. Moreover, all gifts were returned in equal quantity and more. Such continuous exchange of goods in the form of gifts constituted the Papago equivalent for trade but only rarely attained the status of actual trade.

In addition to the extensive system of exchange of goods among themselves, some Papago made trading expeditions to the Yuma. They also journeyed to the middle Gila, the San Pedro and the Indians in the Altar Valley, then later among the Mexicans of various parts of Sonora. This was done particularly at harvest time, Papago from the northern villages traveling to the Gila where they had relatives and friends, those from the southern settlements being in closer contact with Mexico, particularly the Altar Valley. At these places they traded numerous articles and labored in return for food, in historic times chiefly wheat, but formerly maize and beans, as well as cotton. This was observed in 1740, later by Anza;[38] again in 1863-64, and in 1893 by Whittemore,[39] who also noted that when the Papago became very hungry they would journey to the Gila and present for the Pima a "Begging Dance" which had a specific form and lasted two or three nights, in return for which each Pima family was expected to contribute fifty to one hundred pounds of wheat.

In Mexico a few Papago worked as cowboys and at miscellaneous tasks, for which they were paid in money. Such contacts resulted in a more rapid deculturation and disorganization than occurred in the northern villages. Specifically these villages in the south, some of which had raised cattle since Kino's day, began about a century ago to acquire cattle in larger numbers. As a result of hire for money among the

[38] *Documentos*, 3rd ser., IV, 838; Bolton, *Anza*, II, 17.

[39] *Report of the Commissioner of Indian Affairs* for 1863, p. 384; *ibid.* for 1863, p. 153; Whittemore, in *Among the Pimas*, pp. 81-3.

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Mexicans they more and more came to use Mexican goods and to pay less attention to agriculture, thus the arrangement of family geographic units was disrupted.[40]

In lean years among the desert Papago the bulk of the harvesting on Pima farms was done by the Papago, and the custom of such labor for hire has continued until quite recent times. However, desert Papago almost invariably returned to their homes later as it was very rarely that these Indians lived outside their own village except by intermarriage. In ancient times the Pima usually had a rather large and dependable crop, but Pima agriculture was given a strong stimulus beginning with gold rush days in the fifties, and by the eighties the increased penetration of whites created a demand for crop production on a commercial basis. Thus the Papago almost abandoned the northern part of their desert territory to work for the Pima during wheat harvest on the Gila. This was always a great boon to the Papago for whom this time was the leanest part of the year. Here they remained for about a month, a fourth of which was spent trading and cutting willow for making baskets. For their labor the Papago were given daily food and a share of the crop. Although May and June, the time of wheat harvest, constituted the period of greatest Papago movement to the Gila, some of these Indians returned in late fall to assist in planting, and to pick cotton.

Despite the hiring of Papagos by the Pimas, due to commercial growing of wheat by these Indians, the northern Papago villages continued to be agricultural, adding the raising of cattle to the extent of supplying the amount of meat formerly secured by hunting. Moreover, here the arrangement of family geographic units remained intact.

One must not get the impression, however, that irrigation was a culture trait characteristic of Pima, Sobaipuri and Soba, but lacking among Papago. These peoples were one in speech

[40] Underhill, *op. cit.*

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and general culture, the Papago simply being environmentally differentiated Pima, "desert Indians with an agricultural heritage," who dwelt in a land where running water for irrigation was not available. Desert conditions therefore imposed upon them a different way of life in a land where agriculture could be naught else but marginal. In this connection Bryan[41] has pointed out very fittingly that the usually clear distinction between irrigated and unirrigated farm land breaks down in the consideration of marginal lands irrigated by flood water, in some cases there being a complete transition. Papago fields were situated at the mouths of washes fed intermittently from desert mountains, and here they utilized to the utmost, in their primitive but efficient manner, the extremely meagre and precarious agricultural opportunity made possible only by summer rains. Thus with an average precipitation of less than five inches the Papago cultivated and continue to cultivate their basin lands with an incipient system of irrigation.

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Moreover, irrigation was reported in those areas inhabited by Papago where there were running streams. Thus at San Marcelo de Sonoita, with its good arroyo of permanently running water and many good springs in the vicinity, the Papago, toward the close of the seventeenth century, were practicing irrigation by means of ditches leading from the arroyo, as they did at a *ranchería* near Caborca;[42] and Anza,[43] three-quarters of a century later, noted that these Papago at Sonoita and Quitobac were still irrigating small pieces of land with running water from springs. The village of Sonoita was a favored site as the Sonoita River is here a permanent stream. Irrigation was also possible from the waters of the large fissure spring at Quitobaquito, a veritable small oasis. It should be explained that the Sonoita River is the only interrupted stream rising in the Papago country. Drainage

41 Bryan, *Flood-water Farming*, p. 444.
42 Mange, *op. cit.*, pp. 262, 285; Bolton, *op. cit.*, pp. 188, 225, 255.
43 Bolton, *Anza*, II, 22, 148, 150.

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from the Baboquivari and Quijotoa valleys runs by a circuitous route through the Great Plain and unites with similar ephemeral streams in Sonora to form the Sonoita. Except for occasional floods the channel is dry for more than twenty-five miles to a point a short distance above Sonoita.[44] Similarly, irrigation was practiced at San Xavier by the Papago who occupied this village after the Sobaipuri had abandoned it within historic times. Maps in Bryan's[45] report and those in Hoover's paper show in parts of the Papago-Pima country the location of fields, streams, washes, springs, tanks, *represas* etc.

The Papago continue to the present to pursue their de *temporal* farming much as they have always done, although Pima agriculture has undergone marked changes. The Federal Government, beginning in 1913, drilled wells in a number of Papago villages and such wells are now scattered throughout Papago territory, but they are used for watering stock and enabling residents to remain throughout the year, and have no bearing upon the growing of crops. In 1919[46] the desert Papago in Arizona were reported as flood-water farming about sixteen thousand acres of land, while those at San Xavier had about fifteen hundred under ditch irrigation, with water largely from wells.

Three changes in Piman life, affecting both Pima and Papago, have been of the utmost importance in ameliorating their economic condition, even though the concomitant white influences have resulted in pronounced deculturation, notably among the Pima. The first of these was the introduction of foreign crops. The earliest to be received, and the most important for both peoples, was wheat. This provided an off-season crop, planted anywhere from mid-November to early February, depending upon the winter rains, and harv-

[44] Bryan, *Papago*, p. 119.
[45] Bryan, *ibid.*; Hoover, *The Indian Country of Southern Arizona*.
[46] *Report of the Commissioner of Indian Affairs* for 1919, pp. 279, 287, 289.

5: Castetter & Bell N-5 (1938-1940) 1942
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which they depended wholly for support. In 1919 it was estimated that the aggregate cattle holdings of the desert Papago were about thirty thousand head.[48] As late as 1846 the Pima were reported as having few cattle and these only for tillage.[49] Pi Pa 179 231

The modern Pima have profited greatly by the introduction of cattle; today they not only raise cattle for their own use, but more commonly rent their lands for pasturing cattle owned by the whites. The grazing of custom cattle by the Pima has steadily grown since November, 1932, when six hundred were secured from the Tremaine alfalfa ranch. In 1935 approximately 55,000 such cattle were on the Gila River Reservation, and during the winter months of the same year about twelve hundred sheep also were pastured there. Many of the Pimas now work for hire, as is true with the Papago at San Xavier, at Tucson and the copper mine at Ajo. Individuals of both groups eke out an existence or supplement their meagre income by cutting and marketing dead wood. Beginning in 1933 marked stimulus was given toward acculturation, particularly among the Papago, by the appropriation of emergency conservation funds. This is having far-reaching effects upon Papago as well as Pima economy and culture; it is transforming Papago economy from a gift and barter to a money basis and gradually raising their standard of living.

• • •

It would be highly desirable to present an accurate statement of the amount of land anciently cultivated per family among Pima and Papago as well as the total amount of crops and wild food used annually per family or per person. Due to cultural disturbances and distortions, however, it is now very difficult to arrive at exact figures. Moreover the ratio between cultivated and wild foods utilized fluctuated con- Pi Pa 174 311 241

[48] Curtis, *The American Indian*, II, 31; *Report of the Commissioner of Indian Affairs* for 1904, p. 149; *ibid.* for 1919, p. 287.

[49] Emory, *Notes*, pp. 85-5.

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siderably from year to year, and the areal variability of soils and climate entered in. Thus the Papago village of Vamori was reported by Clotts[50] as having a cultivated acreage of 7.03 per person, but considerable allowance must be made for the fact that the fields there had quite poor soil. The Papago habit of seasonal movement between Wells and Fields and their migration to the Gila and the Altar to work for hire always has rendered difficult the obtaining of reliable population figures. Thus the reports of the Commissioner of Indian Affairs[51] beginning in 1863 variously recorded the Papago population of Pimería Alta as follows:

Year	*Population*	*Year*	*Population*
1863	7500	1885	7300
1865	5000	1895	2648
1872	6000	1903	2542
1875	6000	1911	about 5000
1883	7500		

Population on the reservation at San Xavier was reported as follows:

Year	*Population*	*Year*	*Population*
1865	(80 families)	1893	427
1882	250	1895	517
1883	500	1896	542
1885	250	1899	502
1887	137	1900	519
1890	363	1903	523

In 1858 Chapman's census listed the number of Pimas on the Gila as 4,117; in 1914 the number on the reservation at Sacaton was 3,796.[52] Part of the discrepancy in the above figures is due to allottees only being included in some cases, in others all the inhabitants of the reservation.

[50] Clotts, *Nomadic Papago Survey*, p. 80.

[51] *Report of the Commissioner of Indian Affairs* for 1863, pp. 385, 390; *ibid.* for 1865, pp. 135, 389; Clotts, *History of the Papago Indians*, etc., pt. III.

[52] *Report of the Commissioner of Indian Affairs* for 1858, pp. 554-60; *ibid.* for 1914, p. 77.

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In 1878 the Papago were reported as cultivating 2,500 acres of land and as having grown six thousand bushels of wheat, five hundred of corn and three hundred of oats and barley. More directly to the point is a careful survey of 1914[52] made in an effort to determine the Papago population, and the figures presented were regarded as quite reliable. Exclusive of the San Xavier and Gila Bend reservations, the Papago population that year was reported as 5,662. This survey has particular significance for our purpose since it also reported that these desert Papago cultivated by flood-water farming 9,177 acres of land (and had from fifteen thousand to thirty thousand cattle). Clotts therein listed a large number of settlements, giving data on population and acreages; but considering only those forty-seven villages for which he presents both population and amount of land cultivated, the average acreage per person was 1.79. The lowest per person was .02 at Copperosity, the winter home for the summer village of Anegam, the former site of which was Omik-Vaxia (Salt Well); the highest, 7.03 at Vamori where the soil is of poor quality. Information given us by old Papagos indicates that in the days of their fathers and grandfathers the cultivated acreage per family in their villages ranged from one-fourth to a maximum of two acres. Chico Bailey informed us that, as a young man, he planted for his own family a plot of corn fifty by seventy-five yards (approximately three-fourths of an acre); José Petero stated that in his boyhood the average family had, in addition to their corn, teparies and pumpkins, a wheat field covering about a half acre.

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Our Pima informants stated that in the days of their grandfathers most families cultivated from one to five acres although a big land owner might have as much as twenty, much of which was secured by inheritance. Size of Pima farms was reported in 1871 as averaging from ten to fifteen

Pi 174 241 311 [423]

[52] *Ibid.* for 1878, p. 298; Clotts, *Nomadic Papago Surveys*, p. 80.

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174 acres per family (doubtless an exaggeration); in 1883 as from
241 one-fourth to two and one-half acres; and in 1887 as ten acres
311 which sufficed for the wants of the ordinary family.[84] Similarly, Russell observed in 1901 that Pima farms ranged from one to five acres per family, and more recently Southworth[85] indicated that Pima family plots varied from five to fifteen acres, and that in 1915 on the reservation at Sacaton this was close to ten acres, although some Indians might hold more than one such field. The Pima around Sacaton were reported as having cultivated about three thousand acres in 1854,[86] and the Pima population on the Gila was listed in Chapman's census of 1858 as 4,117. These two dates are relatively close, and if we assume the figures to be correct we arrive at a cultivated acreage of about three-fourths of an acre per person. It is our own judgment that in early historic times the cultivated acreage per Pima family varied from two to five acres. Moreover, it is certain that the average size of the Pima farm anciently was much smaller than at present.

The amount of land cultivated by the Pimas on the Gila River Reservation in 1854 was about three thousand acres; in 1919, 10,610 acres; in 1923, 8,965 acres, and in 1929 crops were harvested from 7,774 acres.[87]

Pi
Pa In a recent paper Kroeber[88] calculated a yield of fifteen to
194 twenty bushels of shelled corn per acre in the aboriginal
241 "agricultural east," the lower figure of fifteen being supported by the work of Hinsdale[89] for Michigan. Moreover, Kroeber concluded that the yield of one acre would be sufficient to support one person for one year. In this connection Voe-

[84] Grossmann, *The Pima Indians of Arizona*, p. 418; *Report of the Commissioner of Indian Affairs* for 1883, p. 64; *ibid.* for 1887, p. 4.

[85] Russell, *Pima*, pp. 87-8; Southworth, *A History of Irrigation on the Gila River Indian Reservation.*

[86] According to Rev. C. H. Cook who began living among the Pima in 1870, Cloutz, *op. cit.*

[87] *Report of the Commissioner of Indian Affairs* for 1919, pp. 84, 94, 140, 160; King and Leding, *Agricultural Investigations*, p. 5; King and Loomis, *Agricultural Investigations*, pp. 8-9.

[88] Kroeber, *Cultural and Natural Areas of Native North America*, p. 148.

[89] Hinsdale, *Distribution of the Aboriginal Population of Michigan*, p. 24.

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gelin[80] finds Kroeber's estimate of one acre of cultivated land per person much too high at least for the Shawnee during the eighteenth and nineteenth centuries, but does not dispute his figure of fifteen to twenty bushels of corn necessary to support one person for one year. Accepting the weight of fifty-six pounds of shelled corn per bushel (Pima-Papago corn averages three to four pounds less), Kroeber estimates that one thousand pounds of corn (in round numbers the annual yield of one acre, about eighteen bushels), or a little less than three pounds per person per day, should more than sustain the average person in a community composed of men, women and children.

Under early conditions Piman native corn yielded on the average only ten to twelve bushels of shelled corn per acre, although as grown by the U. S. Field Station on the reservation at Sacaton the same corn yields twenty to twenty-five bushels; teparies, under native conditions, five hundred to eight hundred pounds per acre—under Field Station cultivation, as high as fifteen hundred pounds; and wheat, an introduced crop, ten to twenty bushels with native culture, and forty to fifty bushels at the Station.

In our judgment the figure of 1.79 acres of cultivated land per person as derived from the data of Clotts[81] is too high when applied to the whole desert Papago area. Our most reliable figures indicate that the desert Papago, before white contact disturbed their economic pattern, cultivated from one-fourth to a maximum of two acres per family. Allowing an average of twelve bushels an acre, this means a crop of about three to twenty-four bushels of shelled corn, or its equivalent in teparies and pumpkins, per family. Assuming a family size of five, this would allow about three-fifths to five bushels per person per year. In terms of Kroeber's subsistence level (eighteen bushels per person per year),

[80] Voegelin, *The Place of Agriculture in the Subsistence Economy of the Shawnee.*

[81] Clotts, *op. cit.*, p. 80.

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this would indicate the desert Papago cultivated food supply ranged approximately from one-thirtieth of the annual food consumption among some families to one-third of the total among others. Actually, however, the figure was somewhat less because of several factors: (1) On Papago cultivated plots not all the land was level and therefore portions of it were not tillable since they could not be flooded. This was particularly true at points where water entered fields and deposited silt; (2) Papago (and Pima) ate a large fraction of their corn crop in the roasting-ear stage and this reduced its actual yield in terms of total food value. This practice has rendered it very difficult to compute yield of maize per acre; (3) it was customary for Papago (and Pima) to gorge themselves when food was abundant, with little providence for the future. This resulted in such an inequable distribution of the crop that frequently this entire food supply was eaten up by the end of December.

On the above basis, our field and historical studies of the Pima level of economy from the standpoint of their agriculture indicate that anciently the cultivated acreage per Pima family was two to five acres. In arriving at this figure we are guided somewhat by the amount of land it was possible physically for a family to cultivate with primitive implements. Again assuming an average family size of five, we arrive at a figure of two-fifths of an acre to one and one-fifth acres per person, or five to fifteen bushels of corn or its equivalent per person per year. This would mean the cultivated crop supplied approximately from one-fourth of the total food requirements among some families to nearly the entire amount among others.

The conclusion we are forced to draw from our own field studies, as well as historical accounts as to the ancient basis of Pima subsistence, is that, before white contact radically disturbed the economic pattern, the Pima cultivated crop in average years comprised about 50 to 60 per cent of the total

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food supply, wild plants and animals constituting the remainder; thus food gathering was absolutely necessary to supplement the inadequate cultivated crop. Our estimate is supported by Russell's[62] statement made forty years ago that mesquite constituted nearly, if not quite, the chief native article of Pima diet in primitive times; also by that of Whittemore[63] that mesquite beans were the principal article of Pima food. Mesquite was a dependable food and the Pima ate it in abundance every year. Their aboriginal crops were maize, beans, pumpkins, cotton and gourds. In years of inadequate water supply or crop failure from other causes they were forced to rely even more heavily upon wild plant and animal foods. Their strong reliance upon wild foods, chiefly mesquite and sahuaro fruit, supplemented by screwbean and cholla buds and fruits on the plant side; plentiful jackrabbits and less numerous deer and mountain sheep, as well as fish (although they had less access to fish than did the Colorado River peoples) and beaver on the animal side, bespeaks that agriculture was not overwhelmingly their basis of food supply. Wild plant products had a much more important place in their diet than did game, the ratio being about three to one. Apart from the killing of rabbits, hunting never constituted a major occupation, but a hunter would usually get about a half dozen rabbits in a day's hunt.

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On the basis of our similar studies among the Papago, it is possible to conclude that anciently these Indians in average years cultivated only about one-fifth of their total food supply, four-fifths consisting of wild plant and animal products, supplemented by such variable amounts of cultivated foodstuffs as were secured from the Pima and their relatives in the San Pedro and Altar valleys in exchange for labor. In years of poor crops the balance was shifted even further in the direction of native wild foods and reliance upon these relatives and friends.

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[62] Russell, *op. cit.*, p. 74.
[63] Whittemore, *op. cit.*, p. 54.

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Pa 194 241 311 262 Papago utilized considerably more native plant food than wild animal life, the ratio being approximately four to one; also more deer and less rabbits than did the Pima. These native plant foods were mainly sahuaro and organ-pipe cactus fruit, cholla buds and fruit, mesquite beans, seeds of ironwood and paloverde, certain greens and sand root. Several months of every year were spent by the women gathering and preparing wild plant foods, and every family spent three or four weeks in late June and July gathering sahuaro, the women doing the gathering and preparing the fruit, the men guarding camp and hunting rabbits and rats. Among animals their reliance was upon deer, and, in diminishing order, rabbits, antelope, mountain sheep, rats and larvae. A family group formerly had no more than one or two hunters, each killing about twelve to fifteen deer per year. Many families had no hunter, so the kill was distributed among the entire economic unit with which they were affiliated, ranging usually from two to ten families.

Pa Pi 174 241 Thus it is obvious that in normal years of crop production the Papago made much more extensive use of wild products than the Pima. In comparison with the Maricopa the Pima depended appreciably more upon cultivation and less upon wild products than did these neighbors on the Gila, to whom mesquite and screwbean are reported as more important than maize.[64] Bartlett[65] wrote in the middle of the last century that Leroux had ascertained the Pima were much better supplied with corn and every other commodity than were the Maricopa. The stronger emphasis upon agriculture by the Pima as compared with the Maricopa is attested also by the presence of extensive canal irrigation, while the Maricopa depended entirely upon the inundation of flood plains and sub-surface seepage.[66]

Although the agriculture of the Gila Pima and the Papago

[64] Spier, *Yuman Tribes*, pp. 48, 58-9.
[65] Bartlett, *Narrative*, II, 251.
[66] Spier, *loc. cit.*

5: Castetter & Bell N-5 (1938-1940) 1942
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was on a lower technological level than that of the irrigated valleys of Sonora, these Indians were relatively good farmers. Despite the fact that they, particularly the Papago, cultivated small acreages, they did so intensively. The supreme Piman virtue was industry. The farmer arose before sunrise, worked without cessation until near noon and rested during the hottest part of the day, then continued work until dark. The heat prevented rapid labor, hence his toil was slow and plodding but unremitting.

* * *

Utilization of Native Wild Plants

In the Papago region certain wild staple foods grew in abundance and were extensively utilized. Highly important among these were the fruits and seeds of sahuaro *(Carnegiea gigantea)*, and, in the southern part of Pimería Alta, organ-pipe cactus or pitajaya[67] *(Lemaireocereus Thurberi)*. Of such value was sahuaro that each family established a permanent camp in the nearest available cactus area; its significance is further indicated by the fact that sahuaro harvest marked the beginning of the new year in the calendars of both Papago and Pima. Kino noted the extensive use of pitajayas in the Indian diet in traveling among Papagos from the Gila River to La Concepción (Caborca), as well as in the vicinity of San Luis Bertrando where he observed that the numerous pitajayas lasted the Papago until December.[68]

Another very outstanding food was cholla buds, fruits and joints, and some informants regarded cholla buds of even more importance than sahuaro fruit. Buds of the abundant *Opuntia echinocarpa* and of the jumping cholla *(O. fulgida)*, gathered in May, and the fruit, which ripened in late summer, were pit-baked and constituted staple foods, while the fruit and sometimes buds and young joints of the vari-colored

[67] Pitajaya or pitaya here refers to the fruit of either or both *Carnegiea gigantea* and *Lemaireocereus Thurberi*; sahuaro invariably refers to *Carnegiea gigantea*.

[68] Bolton, *Kino*, I, 256.

5: Castetter & Bell N-5 (1938-1940) 1942
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Chapter IV

PIMAN CULTIVATED CROPS

Examination of the early literature reveals that Piman agriculture at the close of the seventeenth century, in harmony with the agricultural situation in the Southwest in general, centered around the maize-bean-pumpkin complex. Kino, Mange and others[1] repeatedly refer to the Papago, Pima and Sobaipuri cultivating and utilizing much maize, beans, pumpkins and in some places cotton. Although these Indians had gourds,[2] there is no specific reference to their cultivation. The early accounts do not record the growing or utilization of tobacco, and there is no indication that its culture was pre-Spanish. While *Martynia* for some time has been grown for use in basketry, it is uncertain whether it was cultivated aboriginally. Sunflowers were never cultivated nor even utilized. Although maize was the most important Piman crop, and could be utilized as food in more ways than any other, among the Papago the tepary bean approached it in value because of its tolerance of drought. As indicated by our own field studies, as well as the work of Forde, Gifford, Kroeber, Drucker and Spier,[3] there was considerable similarity between the crops and basic economy of the Pima-Papago and those of the tribes on the lower Colorado River.

With the coming of the Spaniards various Old World crops were introduced into Pimería Alta, although it is clear

[1] Mange, *Luz*, pp. 215-17, 229-30, 247-50, 256; Bolton, *Kino*, I, 187, 195, 207, 246, 253, 291; II, 207; *Documentos*, 3rd ser., IV, 858-59; Coues, *On the Trail*, I, 107.

[2] Bolton, *op. cit.*, 270; Wyllys, *Velarde's Relación*, pp. 133, 136; Mange, *op. cit.*, pp. 249, 263.

[3] Forde, *Ethnography of the Yuma Indians*, pp. 107-14; Gifford, *The Cocopa*, pp. 263-67; Kroeber, *Handbook*, pp. 735-37; Drucker, *Culture Element Distributions: XVII, Yuman-Piman*; Spier: *Yuman Tribes*, pp. 48-81; *Cultural Relations of the Gila River and Lower Colorado Tribes*.

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that at least wheat, flax and watermelons had reached part of the area before Kino's arrival in 1687. In order to furnish a more stable food supply for Indians at the missions, and to give them a more secure basis of economic prosperity and independence, Kino distributed seed of wheat, chick peas, bastard chick peas, lentils, cowpeas, cabbages, lettuce, onions, leeks, garlic, anise, pepper, mustard, mint, melons, watermelons and cane, as well as grapevines, roses, lilies, and trees of pear, apple, quince, mulberry, pecan, peach, apricot, plum, pomegranate and fig.[4] Some suggestion of the extent of his industry in getting crops planted and herds of cattle established may be obtained from his observation that in April, 1687, only about a month after his arrival in Pimería Alta, the Indians in Nuestra Señora de los Remedios were very disconsolate and did not wish to be Christians, because among other things the fathers required so much labor and sowing for their churches that no opportunity was left the Indians to sow for themselves, and so many cattle were pastured that the watering places were drying up.[5]

An interesting reference was made by Mange[6] to the effect that in June, 1694, in company with Kino and Gilg, he found the Pima Indians growing flax in the vicinity of San Miguel del Tupo, which had a lake and springs of water. Kino was very skeptical of its being flax, but this was later verified and, although not as fine as that cultivated in Europe, they concluded it was of the same kind. Thus Kino's surprise at the occurrence of cultivated flax in Pimería Alta indicates that it had been introduced into Mexico from Europe and moved northward into Sonora previous to his arrival in the area. A wild blue flax *(Linum Lewisii)* does occur in mountain valleys through the Southwest into Mexico, but we have no knowledge of its having been cultivated, except ornamentally by whites.

[4] Bolton, *op. cit.*, 122-23, 204, 248-49, 253, 321; II, 89, 100, 138, 165, 265.
[5] Bolton, *op. cit.*, pp. 114-15.
[6] Mange, *op. cit.*, p. 260; Bolton, *op. cit.*, p. 194.

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As the penetration of foreign animals into Pimería became very rapid soon after Kino's arrival, he quickly established a number of stock ranchés with cattle, oxen, horses, mules, burros, goats, sheep and chickens.[7] A letter written by Salvatierra to Father Leal in 1699 notes that "already there are here eight species of animals from the other side, now acclimated to Loreto [in adjacent Lower California]."[8] However, as late as 1846 Emory[9] stated that the Pima had few cattle and these were used for tillage.

There is every indication that no antagonism existed on the part of the Pima-Papago to the introduction of foreign crops by the Spaniards, in fact they received them with enthusiasm. Although these Indians had a very high regard for their own ancient crops, the mere fact that the introduced ones produced well was all the justification needed for their acceptance.

The introduced crops which proved to be of greatest significance in early Piman economy were wheat, barley, watermelons and cowpeas, and in that order; the most important domesticated animals were horses and cattle. Although maize was anciently the leading crop the introduction of wheat gradually shifted the balance, and, among the Pima, wheat rather quickly came to rank first, maize second; among the Papago, maize continued to hold first place until about a hundred years ago because of the difficulty of adjusting wheat culture to the desert habitat. A perusal of reports of the Commissioner of Indian Affairs for the last third of the nineteenth century, with their tables showing the large yields of wheat in comparison with the small yields of maize for Pima and Papago, enables one to appreciate the marked extent to which wheat replaced maize in Piman economy.

In 1863 the Pima were reported as growing wheat, maize,

[7] Bolton, *op. cit.*, pp. 122-23, 143-44, 165-66, 204, 321, 357-58; II, 150, 168; Mange, *op. cit.*, p. 309; Wyllys, *op. cit.*, pp. 128-29.
[8] Bolton, *op. cit.*, p. 223.
[9] Emory, *Notes*, pp. 83-5.

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barley, beans, peas, melons and pumpkins.[10] In 1846 Emory found them cultivating maize, wheat, watermelons, beans, pumpkins and cotton, and in 1856 he added to the list sugar cane and peas.[11] Similarly, in 1873 Grossmann[12] said of them "Wheat, corn, beans, and above all, pumpkins and mesquite-beans are their principal food," and indicated that wheat actually was their main crop, with barley, onions and cotton of lesser importance. Whittemore[13] wrote in 1893 that more than one hundred years before that time the Pima on the middle Gila raised maize, melons, pumpkins, cotton and "a small round seed which they ground and boiled as mush"; Lloyd[14] in 1903 likewise found them growing wheat, maize, beans, pumpkins, watermelons, peppers, gourds, tobacco, and a pea which was probably the chick pea (native cotton by that time had ceased to be grown). Although he observed that perhaps even more than maize or wheat the staple food of the Pima was beans, there can be no doubt that wheat was their leading crop then as it had been for a long time. This is supported by the statement of Russell[15] that wheat was their most important crop when he worked among them in 1901-02. Wheat continued to hold this leading position with both Pima and Papago, at least until 1924, and today ranks second only to alfalfa in Pima acreage. In 1919 the main Pima crops, ranked on the basis of cultivated acreages, were wheat, cotton, alfalfa (one thousand acres, practically all Hairy Peruvian), barley, milo and beans.[16]

In 1907 the Coöperative Testing Station at Sacaton, on the Gila River Indian Reservation, was established through

[10] *Report of the Commissioner of Indian Affairs* for 1863, p. 384.

[11] Emory: *loc. cit.*; *Report on the U. S. and Mexican Boundary Survey*, p. 117.

[12] Grossmann, *The Pima Indians of Arizona*, p. 419.

[13] Whittemore, in *Among the Pimas*, p. 52; although one cannot be certain of the identity of this plant, it is possible it was one of the semi-cultivated grasses known to the lower Colorado River tribes and to the Maricopa.

[14] Lloyd, *Aw-aw-tam Indian Nights*, pp. 58, 60.

[15] Russell, *Pima*, p. 90.

[16] King and Leding, *Agricultural Investigations*, pp. 5, 29.

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The following information on the several crops is based upon numerous collections made in the field among Papago and Pima by the authors, as well as upon other field collections made by Ruth M. Underhill among the Papago. Determinations of types were made by the authors except as otherwise indicated. All lots have been deposited in the Laboratory of Biology at the University of New Mexico.

As regards maize, the following were secured:

White soft	thirty collections,	several hundred ears
Yellow soft	five collections,	fifteen ears
Purple soft	three collections	eight ears
Red soft	three collections,	nine ears
White flint	two collections,	two ears
Yellow flint	three collections,	four ears
Pop corn	two collections,	several hundred grains
Sweet corn	two collections,	several hundred grains

In the twenty collections of brown and twenty-two of white tepary beans were found occasional seeds of other tepary types. There were three lots of pinto beans, four of common pink beans, three of common red or Colorado, four common yellow kidney beans, five of lima beans, six of cowpeas; also three collections of chick peas and two of lentils.

Twenty lots of seeds of cheese pumpkin, eighteen of cushaw pumpkin and one of *Cucurbita Pepo*, as well as six of gourds, were made; also eight collections of watermelon and seven of muskmelon seeds.

As to tobacco, we have three collections of plants of *Nicotiana trigonophylla*, and one of *N. attenuata;* one of seeds of *N. tabacum* and two of seeds of *N. rustica*.

Our collections include three separate lots of *Martynia louisiana*.

Maize

Maize was cultivated by the Hohokam,[21] who preceded the Pimans in the Gila Basin, and there are also archaeological specimens from sites on the fringes of the Piman area, such as Tonto Cave, Canyon Creek Ruin and sites on the

21 Haury, in Gladwin *et al*, *Excavations at Snaketown*, I, 158.

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upper Gila River (see Chapter III). Although it has been thoroughly established by documentary material, dating from the close of the seventeenth and beginning of the eighteenth century, that the Pima-Papago grew maize aboriginally,[22] neither archaeology nor the early documentary material gives any indication of the types. Thus we have only ethnographic studies, in reality tradition, to inform us as to ancient types of maize. All our informants agreed that the ancient Pima-Papago corns were of a single type, namely flour corn.

This flour corn of early times was of three distinct colors—white, yellow and blue—the white most common, yellow next. Red flour corn was occasionally seen but was not regarded as a standard sort. Ears of all four colors as grown by these Indians today are slender and only slightly tapering, rarely more than seven inches in length, and extending from about one and one-half inches in diameter at the butt to about one and one-fourth inches at the tip. The cob is regularly circular in cross section rather than elliptical as in some of the Southwestern corn, particularly archaeological specimens. Generally the ears are twelve-rowed, but occasionally ten or fourteen, and in rare cases eight, with grains wedge shaped and usually medium in size. No particular difference was observed in size of ear or grain among the several colored corns of either Papago or Pima, and all informants stated any variation was dependent upon conditions of cultivation rather than being "in the blood." For example, ears seen in Kohatk village in 1939 were of large diameter with very large grains, which the owner attributed to the abundance of water during that season. On the other hand, all ears seen at Vamori village in 1939 were quite slender and small grained, and we were informed that corn in this village is regularly small-eared because of poor soil.

A number of samples of flour maize, secured from differ-

[22] Mange, *op. cit.*, pp. 215, 217, 230, 247, 249, 250, 256; Bolton, *Kino*, I, 187, 195, 246, 291; II, 207.

5: Castetter & Bell N-5 (1938-1940) 1942
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sequently being reduced. Nevertheless, the Pima still grow from three to five hundred acres of the native types, these plantings consisting of Pima soft white, Pima soft yellow, Pima soft blue, and Santan Yellow which is a hard flinty sort. The soft Pima varieties are not only popular for domestic use but have met with favor in some of the markets of the Salt River Valley. Many of the Pimas are able to secure substantial yields of both the native Pima soft kinds and Santan Yellow flint because of the short period required for maturing and low water requirement, only one irrigation being necessary. Development for the Pima, by the Field Station, of a sweet corn with relative freedom from corn earworm damage, has proved to be quite difficult.

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Beans

Our investigations among the Pima-Papago reveal that they are now growing three species of beans: teparies *(Phaseolus acutifolius)*, kidney beans *(P. vulgaris)* and lima beans *(P. lunatus)*.[82] However, the relative antiquity of the three among these Indians is difficult to determine. Although Fewkes[83] reported finding beans (and maize) in an excavated room east of Casa Grande, an edifice occupied jointly by Hohokam and Pueblo peoples, a letter from J. E. Graf, of the Smithsonian Institution, where Fewkes' material is located, advises that neither the beans nor the maize mentioned are in the Smithsonian collections.

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Kino, Mange and Velarde,[84] who visited Pimería Alta while both peoples were still on an aboriginal level, made frequent but indefinite reference to their growing *frijoles*. It is impossible to draw any conclusion regarding the kind or kinds of beans involved, and perhaps the best way to clarify

[82] For seed and vegetative differentia of the three species the reader is referred to: Bailey, *Manual of Cultivated Plants;* Hardenburg, *Bean Culture;* Piper, *American Phaseolineae;* Freeman, *Southwestern Beans and Teparies.*

[83] Fewkes, *Casa Grande*, p. 150.

[84] Bolton, *Kino*, I, 187, 195, 291; II, 207; Mange, *Luz*, pp. 217, 247-50, 256; Wyllys, *Velarde's Relación*, p. 128.

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the matter is by a process of elimination. Mention of the occurrence of the lima bean appears in only one ethnographical report on Southwestern tribes—that of Whiting[35] for the Hopi—and both he and Jones[36] regard it as apparently pre-Spanish among these Indians. As to the archaeology of the lima bean, on the basis of recent investigations at the Tonto Upper Ruin, it is now certain that this bean was grown in the Southwest aboriginally. The material from this site clearly indicates that *Phaseolus lunatus* was cultivated in the Salt River region on the edge of the Piman territory as early as the fourteenth century. A poorly preserved and incomplete specimen of charred cotyledons and pod fragments from the Wupatki excavation (dated 1168-1205 A. D.), about thirty-five miles northeast of Flagstaff and overlooking the Little Colorado River, was determined by Jones with some uncertainty as *P. lunatus*. If the lima beans found by Kelly[37] in a site near Tucson prove to be authentic as to archaeological context, the lima bean in the Southwest will thereby have further support for occurrence in the late twelfth or early thirteenth century.

The early historical accounts make no reference whatever to lima beans among the Pima-Papago, and in this connection it is significant that Freeman, who in 1910-12 investigated the native beans grown by these peoples, made no mention of the occurrence of the lima bean. Thus, in the absence of any specific archaeological or historical evidence among the Pima-Papago, it seems very doubtful that these people had the lima bean aboriginally. However, if opinions secured from informants, which represent Pima and Papago tradition, may be relied upon, it would be possible to conclude that the Pima had the lima bean earlier than did the Papago.

The problem, therefore, seems to resolve itself into a

[35] Whiting, *Ethnobotany of the Hopi*, pp. 12, 81.

[36] Steen and Jones, *Prehistoric Lima Beans in the Southwest;* Reed and Brewer, *Excavations of Room 7, Wupatki.*

[37] Steen and Jones, *op. cit.*, p. 200.

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question of whether the Pima-Papago had both tepary and kidney beans.

Among the references to beans by Kino, Mange and Velarde, only two are sufficiently specific to be of real value. Velarde came to Kino's mission of Nuestra Señora de los Dolores in 1702 or 1703 while the Pima-Papago were still on an essentially aboriginal level. In his *Relación*, written in 1716, he observed that "those who live here are called Papabotas, that is, Pimans who eat beans *(pimas fríjoleros)*, since their principal sowing is the bean called *japavi* . . .";[38] and a little further on said "The rest of the fruits of this Pimería are maize, the small bean called *tepari*, and other seeds . . ." Velarde's account here is somewhat confused and it leaves one at a loss to know whether he is writing of one or two kinds of beans being grown by the Papago. However, his reference to the "bean called *japavi* [papavi]" is evidently to the tepary bean, the Papago name for which is *pawi*, and from which these Indians received their nickname *papawi o' otam* (bean people). The name *papawi* comes from a Spanish pronunciation of the Papago phrase *t pawi*, "it is a bean." Another reason for believing Velarde's references are to the tepary bean is that the Papago name for the kidney bean is *mu:nyi*. Wyllys'[39] translation of the word *japavi* as probably meaning mesquite beans is, in our opinion, erroneous. The only other reference in the early accounts which may be interpreted as referring to the tepary is that of Mange,[40] who wrote of Indians on the Gila (Pimas and Yumas) giving his party "white beans." The absence of white kidney beans among the Papago-Pima today, and Freeman's[41] failure to encounter any when he studied the kidney beans and teparies of these tribes thirty years ago, indicate that white kidney beans at least are unlikely to be aboriginal among them and that

[38] Mange, *op. cit.*, p. 305; Wyllys, *loc. cit.*
[39] Wyllys, *loc. cit.*
[40] Mange, *op. cit.*, p. 165.
[41] Freeman, *op. cit.*

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Mange was undoubtedly referring to the white tepary. Moreover, the Spaniards complained that the Spanish (common or kidney) bean after being grown two or three seasons had a tendency to degenerate into the native tepary.[42] Russell[43] informs us that forty years ago the Pima were growing five kinds of beans, the first known being *tatcoa pavfi* (white bean), doubtless the white tepary, which they regarded as having been brought from the Colorado River Valley in some forgotten time. Pima and Papago informants invariably regarded the tepary bean as an aboriginal, staple crop, and Freeman[44] was definitely of the opinion that it was ancient in cultivation among these peoples. Thus the historical data show quite conclusively that the tepary was being grown by the Pimans at the time of the arrival of the Spaniards.

Archaeological evidence also amply supports the thesis that occurrence of the cultivated tepary bean antedates the coming of white man in the Southwest, but just when it began to be grown in this area is a problem that awaits solution. In addition to the archaeological teparies known from the Gila Basin, and mentioned in Chapter III, the authors have seen the following specimens from the Southwest:

(a) Well-preserved teparies, both white and brown, from Kelly Cave on the San Francisco River, Catron County, New Mexico. About ninety pounds of these beans were found in a storage basket from the Eisele collection. Antiquity uncertain.

(b) White teparies from a cave in the Mimbres River area in southwestern New Mexico. Part of a cache of seventy-five pounds found by Berry Bowen in a large basket. Dating uncertain.

(c) Some white, some black, and some red and black

[42] *Rudo Ensayo*, p. 136; *Documentos*, 3rd ser., IV, 511.
[43] Russell, *Pima*, p. 98.
[44] Freeman, *The Tepary, A New Cultivated Legume from the Southwest*, pp. 398, 400.

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About 1930 the Coöperative Field Station at Sacaton began to select Indian lima types for adaptation to the warmer areas of the Southwest. Beginning in 1931, several color types were secured from the Hopi reservation, and the selected strains of white Hopi limas were obtained from the Agronomy Department of the University of California. In 1932 some samples of the Pima strain were secured which have been designated Pima-Hopi lima. Varying somewhat in color, this strain is typically light tan with black longitudinal markings. Selections were made from the strains and some improvement obtained in their ability to retain flowers and young pods during hot weather and to resist spotting of the young beans. The white strains show greater susceptibility to these disturbances than do the red, black and flecked ones. Nearly all the Hopi and Pima-Hopi lima strains show greater resistance to root knot nematodes than do the various common beans and teparies. Some of the vine types of limas are suitable as a summer cover crop and yield a greater tonnage of vines than do the teparies sometimes used for that purpose.[63]

The chief beans grown today by the Pima are teparies, Pima-Hopi limas and Mexican pink beans *(frijoles)*. Limas are seen in many colors but mostly brown or tan with purple longitudinal markings. These Indians occasionally try other commercial sorts but seldom have any success. The tepary continues to be a more dependable producer among the Pima and Papago than either kidney or lima beans.

Pumpkins

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That the Pima-Papago were growing pumpkins as early as the time of Kino's arrival in Pimería Alta is well authenticated. Kino and Mange[64] refer a number of times to the cultivation and utilization of pumpkins *(calabazas)* by these

[63] King, Beckett and Parker, *Agricultural Investigations*, p. 58.

[64] Bolton, *Kino*, I, 187, 195, 248, 291; II, 207; Mange, *Luz*, pp. 217, 249, 256.

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peoples. The only other early reference is that of Velarde[65] who states that since the Spaniards had come into Pimería the Pimans grew pumpkins *(calabazas)* of various kinds. Complete lack of archaeological specimens of pumpkins in the area, going as far back as the Hohokam culture, renders it impossible to extend our knowledge of the existence of pumpkins among the Pima-Papago prior to Kino's day, even though all our informants regarded pumpkins as an ancient Piman crop. However, the occurrence of pumpkin remains *(Cucurbita Pepo* and *C. moschata)* in archaeological sites adjacent to the Piman area, such as the Tonto Ruin, the Canyon Creek Ruin and the upper Gila River is well established[66] (see also Chapter III).

Unfortunately the early historical accounts throw no light whatever on the kinds of pumpkins grown by the Pima-Papago. In our field studies three species were found—*C. moschata, C. Pepo* and *C. maxima.* The first was common everywhere among these tribes and consisted of several varieties, invariably regarded by informants as aboriginal. Both the buff and very dark green cheese pumpkins, usually with slender hard peduncles, were often found; these were commonly of cheese-box shape, occasionally oblong. But most abundant were the pear-shaped cushaws, with neck of varying length, in a variety of colors ranging from very dark green through yellow to netted and mottled green on a cream background. Many had corky longitudinal ridges on the neck and the peduncle was characteristically quite thick. Crookneck cushaws with strongly curved necks were seldom observed.

Although Papago and Pima informants frequently described an ancient pumpkin which gave every indication of being *C. Pepo,* it was only after long and diligent search that we finally found this species—at the Papago village of Big

[65] Wyllys, *loc. cit.*; Mange, *op. cit.*, p. 309.
[66] Hough, *Culture of the Ancient Pueblos of the Upper Gila River Region*; Haury, *loc. cit.*

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The third species was *C. maxima*, located among the Papago only at Big Fields, and here and there among the Pima. Informants invariably said this Banana squash at Big Fields was not a Papago type and had come into the village within the last thirty years; Pima informants also regarded varieties of this species as of recent introduction.

PS 244 172 The above information on the three species of *Cucurbita* is in full agreement with Southwestern archaeological data in general, for numerous specimens of *C. moschata* and *C. Pepo* have been found in Southwestern excavations, but not a single archaeological specimen of *C. maxima* has ever been found in the Southwest, or for that matter in any area north of the interior of Mexico. Thus there is every indication that the Papago-Pima grew pumpkins aboriginally, both *C. moschata* and *C. Pepo* being cultivated before the coming of the white man. Russell[67] says that, according to tradition, the first Pima pumpkin (called *rsás katuk*) were obtained from the Yumas and Maricopas.

Cotton

PS 172 248 Although investigators are not agreed that a continuity exists between the cultures of the Hohokam and their successors, the Pimans, archaeological specimens clearly show cotton was present at an early date in the Gila Basin. Fewkes found cotton at the Casa Grande ruin, and it has been reported from the Grewe site and McEwen Cave; Woodward has reported cotton seed and what appears to be impressions

[67] Russell, *op. cit.*, p. 91.

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of cotton textiles from a Colonial Hohokam site. Also a cotton textile was recovered from the Sacaton Phase in the Snaketown excavations, and cotton seeds and lint were found in other phases[68] (see Chapter III).

That the Pimans were growing a considerable amount of cotton when Kino arrived in Pimería Alta is amply supported. The early Spanish accounts describe the growing of cotton not only by the Gila Pima, but by the Sobaipuri on the San Pedro and at San Xavier.[69] No mention is made of cotton being grown by the desert people (Papago). Kino wrote that natives of Pimería had very good cotton fabrics, and in 1701 noted that the Sobaipuri at San Xavier had given him "many of their good fabrics and blankets of cotton"; and Velarde[70] recorded "The Sobaipuris and other Pimas of the North [evidently along the Gila] sow much cotton, which they weave, and with which they clothe themselves." He also informs us that the dress of those who lived in the north was of cotton cloth, very well woven and painted gracefully with red and yellow. Mange[71] wrote of Sobaipuri Indians at the *ranchería* Santa María de Bugota, as well as those of San Agustín de Oiaur on the Santa Cruz near present day Tucson, dressing themselves with cotton; and of the Sobaipuri Indians at Quiburi on the San Pedro gathering cotton "with which they walk dressed." He also noted that the Sobaipuri inhabitants of Arivavia, also on the San Pedro, gathered "cotton with which they weave premium mantas and painted of various colors, with which they dress and adorn themselves." The *Rudo Ensayo*, evidently written in 1763, in referring to the Gila Pima, records: "So much cotton

[68] Fewkes, *Casa Grande*, pp. 147-48; Jones, *Summary of Data on Aboriginal Cotton*, p. 5; Haury, in Gladwin *et al*, *Excavations at Snaketown*, I, 180-182.

[69] *Documentos*, 3rd ser., IV, 504, 857, 848; Sedelmayr, *Relación*, pp. 108, 108; Bolton: *Anza*, IV, 44; *Kino*, I, 291-92; II, 267; Russell, *Pima*, p. 77; Mange, *Luz*, pp. 248-50, 305; Wyllys, *Velarde's Relación*, p. 109.

[70] Mange, *op. cit.*, p. 305; Wyllys, *op. cit.*, pp. 109, 132.

[71] Mange, *op. cit.*, pp. 247-50, 258.

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is raised and so wanting in covetousness is the husbandman, that after the crop is gathered in, more remains in the fields, than is to be had for a harvest here in Sonora—this upon the authority of a Missionary Father who saw it with his own eyes in the year 1757."[72] Similarly, Font,[73] who visited the Pima along the Gila River while on his journey to Monterrey in 1775-76, wrote that they planted, spun and wove cotton into fabrics, garments and blankets; this was also observed by Garcés. Whittemore[74] stated in 1893 that it was cultivated more than a hundred years before his time. Likewise Oñate's[75] party, which made an expedition to California in 1604-05, observed that Indians along the Gila had cotton mantas, but these were evidently the Maricopa.

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Bartlett, Emory and Whipple[76] reported that a considerable amount of native cotton still was being grown and used by the Pima between 1846 and 1850, and in 1873 Grossmann[77] found them still growing small amounts. The Pima have grown cotton commercially for a number of years, and as early as 1864 the Superintendent of Indian Affairs for Arizona stated that he had furnished the Pimas with five hundred pounds of commercial cotton seed.[78]

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Russell[79] pointed out forty years ago that from pre-Spanish days down to the last quarter of the nineteenth century the Pima cultivated cotton for the fiber, as well as seeds for food. However, cultivation of the aboriginal product gradually diminished, until by 1901-02 it had so nearly ceased that it was only with difficulty that a sufficient amount of raw cotton of Pima raising was secured to weave a small piece of

[72] *Rudo Ensayo*, p. 128.
[73] Bolton, *Anza*, IV, 44, 45; Coues, *On the Trail*, I, 107-08.
[74] Whittemore, in *Among the Pimas*, p. 52.
[75] Hammond, *Don Juan de Oñate*, p. 187; Bandelier, *Final Report*, I, 110.
[76] Bartlett, *Narrative*, II, 223-25; Emory, *Notes*, pp. 83-5; Whipple, *Official Report*, pp. 398-99.
[77] Grossmann, *The Pima Indians of Arizona*, p. 419.
[78] *Report of the Commissioner of Indian Affairs* for 1864, p. 153.
[79] Russell, *op. cit.*, p. 77.

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cloth. Lloyd[80] found the Pima were no longer growing native cotton in 1903. We have found no trace of Pima or Papago cultivation of aboriginal cotton at the present day; in fact, it was impossible to find a single specimen of the ancient product among these Indians, and it is very doubtful whether any aboriginal cotton has been grown by the Papago-Pima for many years. Early accounts make no specific reference to the growing of cotton by the Papago, yet our informants insisted that within their memory, as well as according to tradition, the Papago grew it in favorable places in their areas with flood-water farming, the fiber for weaving and the seed for food. Moreover Lumholtz,[81] writing of the Papago in 1912, stated that native cotton was still found in use. More commonly, however, they secured their cotton by trade from the Indians of the Altar and Gila valleys.

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Lewton,[82] writing in 1912, made mention of a specimen of cotton secured from the Pima at Sacaton by E. W. Hudson, which he considered as belonging to *Gossypium hopi* Lewton. Jones'[83] summary states that T. H. Kearney wrote him that little of the history of this specimen is known, aside from the fact that it was secured from the Pima and the strain has been kept from becoming extinct by making annual plantings at the Field Station at Sacaton. It is evidently seed of this specimen from which annual plantings have been made at the Sacaton Station under the name of "Sacaton Aboriginal," and which was doubtless the kind of cotton cultivated aboriginally by the Pimans. It is a strain of *G. hopi* Lewton, a species found to be very early and genetically quite heterozygous. Genetic experiments, involving interspecific crosses, are reported by Fulton[84] as confirming the evidence from morphological characters that *G. hopi* is more

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[80] Lloyd, *Au-au-tam Indian Nights*, p. 58.
[81] Lumholtz, *New Trails*, p. 95.
[82] Lewton, *The Cotton of the Hopi*, p. 8.
[83] Jones, *op. cit.*, p. 4.
[84] Fulton, *Hopi Cotton*, pp. 333, 338; Lewton, *loc. cit.*

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closely related to *G. hirsutum* L. than to *G. barbadense* L. Segregation was found to be much less pronounced in the F_2 from the cross of Hopi with upland cotton *(G. hirsutum)* than from that of Hopi with Egyptian cotton *(G. barbadense)*; also there was much less sterility in the F_2 of *hirsutum* x *hopi* than in the F_2 of *barbadense* x *hopi*.

The aboriginal cotton grown by the Papago was undoubtedly the same as that of the Pima, and the indication is that the species was a variety of *G. hopi*. Although the Arizona wild cotton plant, *Thurberia thespesioides*, is found frequently in the southwestern mountain ranges in Arizona,[85] there is little or no evidence that it was ever used by the Pimans as a source of fiber. A single Papago informant, Bernabé López, volunteered the information that it was utilized.

With work done between 1908-16 at the Coöperative Testing Station at Sacaton, the growing of Egyptian cotton in the Salt River Valley became recognized as a practicable industry. In 1912 it was shown that the Yuma variety of Egyptian cotton was suitable for this purpose, and in 1910 the Pima variety had its origin as the selection of a single plant out of a field of Yuma cotton being grown at the station. The Pima variety was not grown commercially until 1916, after the station had demonstrated it was decidedly superior in many respects to the Yuma variety, which it soon completely supplanted. The scarcity of water at a time when the cotton crop is in greatest need of irrigation has prohibited any substantial increase in cotton acreage since 1923, when the Pima crop covered 1,920 acres. The acreage is now confined largely to land regularly supplied with water from pumps in addition to the river flow. It has been ascertained that early plantings of Pima cotton are likely to be much more productive than those made after May 1, in fact the early work of the Field Station indicated that the best time

[85] Bailey, *The Wild Cotton Plant in Arizona*; Hanson, *Distribution of Arizona Wild Cotton*.

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for planting cotton in the Salt River Valley in a normal season is during the first two weeks of March.[86] Browne,[87] writing in 1874, noted the Pima planted cotton when mesquite began to leaf out (late March to mid-April), and this corresponds rather well with that of the Maricopa who planted cotton in late March.[88]

Gourds

Kino's only reference to gourds is in a letter to him from Captain Pedro de Peralta, who reported that *tecomates* (gourd vessels) and other spoils which the Apache had stolen in Saracachi had been recovered.[89] Velarde[90] makes two references in this connection. Writing of the paucity of furniture in the habitations of Pimería, he states there were some calabashes *(calabazas)* in which to carry and hold water; also that the Pimans buried the males with their quiver and arrows, some food and a little calabash *(calabazo)* of water. These were doubtless true gourds *(Lagenaria siceraria)*. Mange[91] records that in several places in Pimería the Indians gave his party food in large chocolate cups *(jícaras)*, which were possibly gourd vessels.[92] The use of gourds by the Pima was mentioned by Whittemore in 1893, and Russell,[93] who worked among the Pima forty years ago, noted that cultivated gourds had been known to the Pima for a long time. Thus, the historical evidence indicates the Pimans had and used gourds at the close of the seventeenth century, but there is no

[86] King and Leding, *Agricultural Investigations*, p. 5; King, Beckett and Parker, *Agricultural Investigations*, p. 24; King, *Crop Tests at the Cooperative Testing Station*, p. 10.

[87] Browne, *Adventures in the Apache Country*, p. 109.

[88] Spier, *Yuman Tribes*, p. 49.

[89] Bolton, *Kino*, I, 270.

[90] Wyllys, *op. cit.*, pp. 135, 136.

[91] Mange, *op. cit.*, pp. 249, 265.

[92] The academic translation of the term *jícara* is gourd. However, Dr. Lawrence B. Kiddle, Department of Spanish, Tulane University, has made a detailed study of the meaning of the word *jícara* in various parts of the New World, and he informs us that, as used in Mange's treatise, the term in all probability should be translated basket.

[93] Whittemore, in *Among the Pimas*, p. 54; Russell, *op. cit.*, p. 91.

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specific reference to their cultivation. Although there are no archaeological specimens of gourds known from the Piman or Hohokam cultures, both fruits and seeds of *Lagenaria* have been recovered from the Canyon Creek Ruin[94] and from Tonto Cave which are on the edge of the Piman territory (see Chapter III).

Tobacco

In point of time, the first tobacco smoked by the Papago and Pima was *Nicotiana trigonophylla* Dunal, known as "Coyote's tobacco." This wild species is found from the western borders of Texas to southeastern California and southward, growing in many places throughout Arizona, and in considerable abundance in northern Mexico. It is a common weed in southern Arizona desert foothills and mountains, on plains at altitudes of four to five thousand feet, on alluvial river valley soils, and is found in a number of places on the Sells Reservation. The species also occurs, although not in abundance, in central and northern Arizona at altitudes of four to five thousand feet. This is referred to by the Papago as the tobacco which Elder Brother gave them and therefore as ancient, and it is still used by them to some extent. Those Papago who could do so made expeditions to some of the mountains in southern Arizona to secure it for their own use and for trade, particularly to the Pima who used it to a lesser extent, since, in more recent times at least, they have depended largely upon cultivated tobacco. That it was not extensively used by the Pima is indicated by the fact that some of our informants had never heard of it. It was never cultivated or even semi-cultivated, and among the Papago at least the indication is that it was smoked before they grew tobacco. Both tribes regarded it as inferior in strength and quality to common tobacco (*N. Tabacum*).

Setchell[95] refers to *N. trigonophylla* as occurring in the

[94] Haury, *The Canyon Creek Ruin*, pls. XLVIII, XLVIII.
[95] Setchell, *Aboriginal Tobaccos*, p. 413.

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lesser extent the Papago, now secure their tobacco from the whites and rarely grow it.

The Papago and Pima seldom smoked by itself any wild plant other than *Nicotiana*, nor did they usually mix any wild plant with tobacco to dilute it or to economize, for they liked it strong. However, a lichen known as "earth flowers," which grows on mountains in southern Arizona, was occasionally dried and a small amount mixed with the tobacco. We were unable to secure a specimen of this plant; the one secured by Underhill several years ago and seen by the authors was not in condition to make determination possible. It now seems certain from our investigations with both Papago and Pima informants that this is not the *pihol* flowers referred to by Densmore.[111] One professed to be acquainted with *piholt*, described as a desert plant which when in bloom smelled something like "earth flowers." The lichen used was described by our informants as having a strong sweet smell, being somewhat narcotic and of such magical properties that smoking a little of it mixed with tobacco would attract game while hunting. One informant said sometimes dried tepary leaves were mixed with tobacco, the smoker expressing a wish for a large crop of teparies next season.

It has been impossible for us to determine the antiquity of tobacco smoking or cultivation among the Pima-Papago. The early documentary material is strangely silent as regards both its cultivation and smoking, although it makes frequent mention that these Indians were extremely glad to receive gifts of tobacco.[112] Moreover, archaeology throws no light on the problem among the Hohokam and Piman cultures. Pertinent to the situation along the middle Gila, however, are specimens from Casa Grande National Monument. In 1935 reed pipes from this site were sent for examination to the Ethnobiological Laboratory of the University of Michi-

[111] Densmore, *Papago Music*, pp. 210-11.
[112] Coues, *On the Trail*, I, 106, 109; Bolton, *Anza*, III, 18, 332; IV, 44.

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gan by Charles R. Steen, Ranger. Jones[113] reported that these pipes (as well as others taken from a ceremonial cave on Camelback Mountain near Phoenix) were made of reed grass *(Phragmites communis)*. The pipes from Casa Grande were wrapped with cotton cloth, and both lots were stuffed with leaves of creosote bush as well as broken tobacco leaves. Jones is of the opinion that these are probably leaves of *N. attenuata*. In this same connection it is interesting to note that Fewkes[114] found large numbers of "cane cigarettes" in various rooms at the Casa Grande ruin as well as in caves near Superstition Mountain to the north of the ruin. Of special interest is the fact that he found a small dish of *N. attenuata* in one of the ruins at Casa Grande.

It is our firm belief that neither Papago nor Pima cultivated any kind of tobacco aboriginally, a situation in agreement with that for the Maricopa[115] who were adjacent to the Pima on the Gila, but that they did smoke the wild *N. trigonophylla* and *N. attenuata*.

Martynia

Pima and Papago anciently utilized the pods of devil's claw or unicorn plant *(Martynia louisiana)* in basketry. Although informants asserted that the Pimans cultivated this plant a very long time ago it is impossible to establish this definitely. It is possible that aboriginally they utilized only wild plants of *Martynia*, and that its cultivation came with the commercial stimulus to increased production of baskets.

There were two kinds of devil's claw—a black-seeded variety which grew wild, and a cultivated form with longer pods and white seeds, the longer strips of epidermal tissue being more suitable for making baskets. The white-seeded variety never grew wild but often appeared as a volunteer in cultivated fields.

[113] Jones, *Ceremonial Cigarettes*.
[114] Fewkes, *Casa Grande*, pp. 142-43.
[115] Spier, *loc. cit.*

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Irrigation

When Kino and Mange,[21] in 1687, made their first explorations in Pimería Alta, the Pima on the Gila and the Sobaipuri in the San Pedro and Santa Cruz valleys were carrying on agriculture by means of irrigation from canals and ditches, a fact later noted by Anza (1774), Díaz (1774), Font (1775), Garcés (1776), Emory (1846) and Bartlett[22] (1848-62) for the Gila Pima.

Haury[23] reports that the Hohokam, who preceded the Pimans in the Gila Basin, are known to have practiced canal irrigation as early as 800 (?) A. D. His excavation of a portion of the Snaketown Canal reveals the superposition of three canals, number two having been dug in part out of the sediments filling the first canal, the third channel being excavated into the silt of the second.

Testimony of the early explorers indicates that the Piman canals formed a veritable network and were much larger and more extensive than required. Nevertheless, Haury states the maximum size and greatest scope of systems of the Hohokam canals was rather definitely reached about 1200-1400 (?) A. D. After this the systems dwindled, ending in the comparatively small but efficient Pima ones seen by the explorers of the seventeenth to nineteenth centuries cited above. These were very largely on the south side of the river. When Kino and Mange[24] first encountered the Pima on the Gila and the Sobaipuri on the San Pedro and Santa Cruz, they were carrying on agriculture by means of canal irrigation; Font and Garcés,[25] in 1775, referred to an extensive system of ditches among the Pima of the Casa Grande-Casa Blanca region, and Emory,[26] in 1846, was "impressed with the beauty, order and

[21] Bolton, *Kino*, I, 205; Mange, *Luz*, pp. 248-49, 256.

[22] Bolton, *Anza*, II, 19, 303; IV, 43; Coues, *On the Trail*, I, 107-08; Emory, *Notes*, p. 83; Bartlett, *Narrative*, II, 232.

[23] Haury, in Gladwin *et al*, *Excavations at Snaketown*, I, 57-8.

[24] Bolton, *Kino*, I, 205; Mange, *loc. cit.*

[25] Bolton, *Anza*, IV, 43; Coues, *op. cit.*, p. 107.

[26] Emory, *loc. cit.*

5: Castetter & Bell N-5 (1938-1940) 1942
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ditches by carrying baskets of dirt, a fact noted by Whittemore[44] for the Pima in 1893.

The Pima leveled their fields by carrying baskets of soil from high spots to fill the low ones. Small irregularities were often leveled by flooding the fields when the river was carrying a heavy deposit of sediment.

Over a period of time the Federal Government has supplemented the supply of irrigation water among the Pima by drilling wells on the Gila River Reservation, the first experimental pumping plant having been installed at the Sacaton School Farm in 1904. The Pima do not regard this as very successful since the well water carries a fair amount of salts, and lacks the soil-enriching sediments carried by the silty flood water of the Gila which also improves sandy areas although it penetrates poorly. Despite the fact that the average salt content of the Gila underflow is greater than that of the surface flow, the underground water at Sacaton is regarded as better for irrigation than the average surface water of the Gila.[45] Pumped irrigation water has the advantages of being free of noxious weed seeds, soaks in more deeply and carries out the salts more effectively. The rather clear stored water would be preferable to both except for carrying weed seeds.

Canal Irrigation Among the Papago

One must not suppose that irrigation was a Pima-Sobaipuri trait lacking among the Papago, and that flood-water farming was characteristic of the Papago and not found among the Pima and Sobaipuri. These peoples were one in speech and general culture, the Papago simply being environmentally differentiated Pima whose desert land presented no opportunity for river irrigation. Thus all Pimans who dwelt in areas remote from the rivers necessarily pursued flood-water farming. Moreover, as pointed out in Chapter III, in

[44] Whittemore, in *Among the Pimas*, p. 53
[45] Lee, *Underground Waters of Gila Valley*, pp. 61-2.

5: Castetter & Bell N-5 (1938-1940 1942
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those Papago areas where there were running streams ditch irrigation was practiced, and that this was done aboriginally is clearly shown by Haury,[46] who found traces of ancient canals on the Sells Reservation. One such canal runs in a straight line for seventeen miles in a west by southwest direction from Baboquivari Mountain to the vicinity of Vamori, and is dated as functional in the fourteenth century. A site excavated during the winter of 1939-40 shows a short canal about a half mile long, with strong indication of water diversion from a ditch, also evidently in use during the fourteenth century. Clotts[47] states there is evidence of prehistoric irrigation indicated by old ditches and reservoirs at Santa Rosa, and within recent times the Papago have dug irrigation canals in suitable places to conduct water to their fields. About 1914 they constructed at Cocklebur a canal three miles long with a base width of fifteen feet and a depth of four feet; at Kowlic, nine miles south of Sells, about twenty-five years ago they built a canal fifteen feet wide, three feet deep and a half mile long to take water from the wash for irrigation. Also at Quajote water is taken for irrigation from Copperosity Wash. Lands were irrigated by the Papago from the large fissure spring at Quitobaquito on the Mexican boundary as well as at San Marcelo de Sonoita, at Caborca and Quitobac.[48]

In the western canyons and foothills of the Baboquivari Mountains lie fourteen winter villages, or Wells, at an altitude of about three thousand feet. Of these Fresnal is a very large village, the houses extending about four miles up Fresnal Canyon. The old Baboquivari Valley village was Komalik, with its ancient winter well at Comobabi, in Sonora. However, nearer winter villages have developed in the Baboquivari Mountains, the most important of which is Fresnal.[49]

[46] Emil W. Haury, Personal conversation, April 26, 1940.

[47] Clotts, *Nomadic Papago Surveys*, p. 82.

[48] Bryan, *Papago*, pp. 324, 407; Clotts, *op. cit.*, pp. 44, 49, 75; Davis, *The Papago Ceremony of Vikita*, p. 164.

[49] Hoover, *Generic Descent of the Papago Villages*, p. 261.

17:Castetter & Underhill N,E-5 (1931-1934) 1935
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241 hoe. This was a sword-shaped slab of mesquite *(Prosopis velutina)* about two feet long, sharpened on the lower edge.

Crops were harvested in October, giving a growing season of about one hundred days. After being flailed or winnowed, then thoroughly dehydrated on the roof of the house, they were stored in jars or baskets. The Papagos usually hid their food for safe-keeping.

LEGUMES

262 Tepary, *pawi (Phaseolus acutifolius* var. *latifolius)*
241 Kidney bean, *mu:nyi (Phaseolus vulgaris)*
Vetch *(Vicia sativa)*
Lentil *(Lens esculenta)*
Chick pea, garabanzo *(Cicer arietinum)*

241 Freeman (11), who has made a careful study of the beans and teparies of the Southwest, collected two different types of beans from the Indians of southern Arizona. They were recognized by the Indians as distinct, and are commonly known by the names, "Frijoles" and "Teparies." Frijoles belong to the group of common kidney beans *(Phaseolus vulgaris)*, while teparies belong to that large and variable species, *Phaseolus acutifolius.*

The native tepary, *pawi*, a staple crop of the Papagos and from which they received their nickname *papawi o'otam* (bean people), was grown by Indians of southern Arizona and Sonora and as far west as the Cocopa Indians (13), but its name comes from a Spanish pronunciation of the Papago phrase *t pawi* (it is a bean). The Spaniards found the Papago growing this crop in 1699 (18), and their later reports refer to it as "the small native bean called tepary" (27). The Papagos cultivate at present as many as fifteen varieties of tepary, represented chiefly by different colors (11). However, the one found most valuable for cultivation and for cooking purposes is the white tepary, which grows both as a bush plant and as a climber.

241 Varieties of tepary have been found growing wild in
17 western Texas and New Mexico, also in Sonora, and it must have been cultivated at an early period since a specimen of

17:Castetter & Underhill N,E-5 (1931-1934) 1935
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it has been found in pueblo ruins in northern Arizona. "It was excavated in 1931 from site N. A. 1814, which was a masonry pit-house which seemed to be associated with a P. III small pueblo. The tepary was identified by Gilmore at the University of Michigan and, according to Gilmore, it is the only case of tepary being found in a prehistoric ruin. The specimen was carbonized when the site burned."[3] (The date of this pit-house would, according to present reckoning, fall between 900 and 1350 A. D.) It seems to be established that the aboriginal bean cultivated by the Cocopas was the tepary (13).

Freeman (11) is of the opinion that the tepary was domesticated by prehistoric Indian Races from wild plants growing in the canyons of southwestern United States and northern Mexico. He also believes that the teparies were probably not domesticated from the type form of *Phaseolus acutifolius* A. Gray, but from a larger, more robust, broad-leaved variety of the species, such as was collected by Wright in a valley of Sonora as early as 1854, and described by Gray as distinct, but left unnamed by him, probably on account of lack of material, now abundantly available. However, the careful and extensive work of Vavilov (26) indicates that the cultivated tepary *(P. acutifolius)* is originative of Southern Mexico and Central America.

Planted and grown under dry conditions, side by side with the kidney bean, the tepary has been known to fruit when the kidney bean had not even flowered, and when both fruited the tepary yielded four times as much as the kidney bean. It was no wonder, therefore, that when the season was too short for corn the "bean people" still managed this crop.

Frijoles, now grown by the Papago and in the Southwest in general, are probably descendants of varieties introduced by Spanish missionaries, apparently from Mexico. Russell (22), referring to *Phaseolus vulgaris*, states that

3. Correspondence from Dr. H. S. Colton, Director, Museum of Northern Arizona, under date of June 29, 1934.

17:Castetter & Underhill N,E-5 (1931-1934) 1935
NU28 Papago NU28

241 "At least one variety of the common kidney bean, pole bean,
●174 bunch bean, etc., was known to the natives before the advent of the Spaniards."

241 Teparies and frijoles are still planted at the beginning of the rainy season in holes three feet apart and six inches deep. When harvested the vines are laid on the ground and the beans threshed out with a stick; or if a very large crop, it may be threshed with horses, as is wheat. The threshed [251] beans are dried on the ground or roof and stored in jars. Vetch *(Vicia* sp.), lentils *(Lens esculenta)* and chick peas or garabanzos *(Cicer arietinum)*, all of which have been introduced, are planted in February with the wheat and harvested like wheat in May, but otherwise are treated like beans.

CORN *(Zea mays)*

[262] 243
Red corn ---------- *si-wihpiki huhnyi*
White corn ---------- *to:ta huhnyi*
1. large grains
2. small grains

Yellow corn ---------- *s'uam huhnyi*
1. small, irregular grains, like popcorn
2. large grains, soft
3. a modern variety, attributed to the Navajo

Blue corn ---------- *s'tciata'ki huhnyi*
1. small, regular grains
2. large, irregular grains *(ku:pi)*

Crazy corn, grains of all colors ---------- *tcihpawi huhnyi*
Laughing corn, mixed red and white, large grains ---- *hihihmi huhnyi*

All these varieties are mentioned in Papago planting songs but at present the only ones commonly found are yellow and white. Gifford (13) mentions both a yellow and white and a white soft maize, also a flint maize, grown by the Cocopa under the Papago name of *huhnyi* (corn) and credited to the Papagos.

The different colored corn grains were stored and planted separately and never allowed to mix. When har- [251] vested the grains might be removed from the cob with a

WHY the Desert People work

461 464 The Desert People pick cotton because they need the money they are paid for their labor. Cotton harvesting is hard work and dirty, but as one young Papago who picks 300 pounds a day told the author, "$8 a day is a lot of money to me!" Picking cotton is the most practical way for unskilled Papagos to earn any large sum, and Papago cotton pickers superficially come very close to the concept of the economic man governed only by "laws" of economics. But there are deep-lying cultural reasons for this attitude and need among the Desert People.

CHANGE IN VIEWPOINT

179 178 Originally the Papago people lived in a manner quite different than they do today. After unknown centuries in their harsh semi-desert environment, they had worked out a marvelous adjustment to unfriendly nature and a military balance with surrounding Indians. But the Desert People have had some contacts with Europeans for 250 years. During those two and a half centuries, more and more Papago behaviors have changed to approximate European behaviors. Forms, if not meanings, of Papago action are frequently much like our own. Of course, habits and thoughts most central to Papago culture remain Indian in character. The most complete and striking changes have probably occurred in the economic spheres of life.

● 174 431 437 [224] Once material goods apparently changed hands among the Desert People through a system of gift exchange. A successful hunter divided his kill among families in his village. Later the wife of a good farmer divided some of her tasty dishes so the hunter received an amount roughly equivalent to his meat. Each family was an economic unit if necessary, and no kindred looked beyond its members for aid.

195 790 [230] 241 [465] When Spanish missionaries reached the Desert People they set out to change the Indians spiritually and economically. They introduced new crops and domestic animals to the Papagos along with a new religion. Missionaries introduced the Desert People to a work-exchange system, in which Indians were paid in kind for harvesting and other work (and even for attending mass at first)